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Progress Report

Ozone Measurements to 48 Km
with Chemiluminescent Ozone Detectors*

Submitted by
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January 1981

Report No. AP-62

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Ozone Measurements to 48 Km
with Chemiluminescent Ozone Detectors

This progress report covers the first year of research in our effort to build and fly an ozone detector capable of functioning to approximately 50 km on a lightweight, large volume balloon. Much of the work centered around improving our Rhodamine-B (Rhd-B) chemiluminescent ozone detector. This included reducing the detector's sensitivity to water vapor and conducting extensive environmental tests. In addition a standard ozone sounding device, the electro-chemical cell (ECC), was incorporated into the sounding instrumentation for comparison. The ECC, however, does not work reliably above 25 to 30 km. Some effort was also put into establishing a reliable laboratory calibration system for ozone.

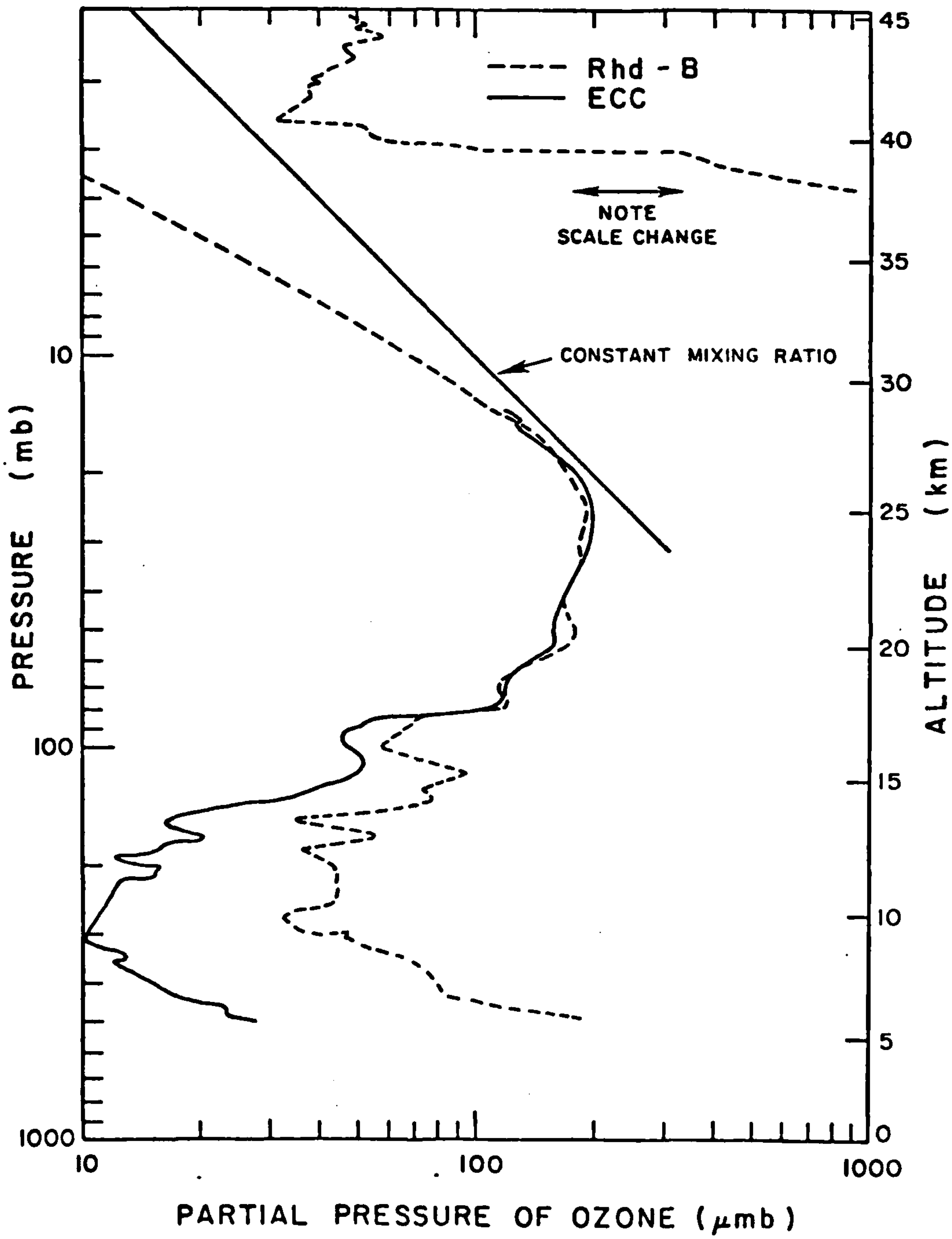
The ozone detector package was launched on September 25, 1980 using a 3.7 M cu. ft. balloon made from .35 mil thick plastic. A maximum float altitude of 48 km was expected; however, the balloon prematurely burst at 45 km. The reason for this failure is now being discussed with the manufacturer.

The payload functioned properly throughout the flight. As expected the ECC ozone detector stopped working at 30 km while the Rhd-B detector continued operating to burst altitude. The results of this flight are shown in figure 1.

After some consideration of the flight's results it became apparent that the Rhd-B detector experienced a drift in sensitivity at high altitude. One of the best ways to deal with this problem is to perform an inflight calibration. We have proceeded along this line of reasoning in preparing for the next high altitude sounding.

It is possible to conceive of many different techniques for inflight calibration and it may be necessary to try several of them before a satisfactory method is found. Our first effort in building an inflight calibrator is based on the production of ozone from a regulated ultra-violet light source. This method has the advantage of being simple, light weight and easily produces calibration levels similar to that of the ambient ozone concentration. This device has been built and is now ready for laboratory testing. Before flying the calibrator on a high altitude balloon it will be tested on an inexpensive sounding to about 30 km.

Although we have had some delays and setbacks the overall results of this project to date seem quite promising.



Rhd - B
ECC
NOTE
SCALE CHANGE
CONSTANT MIXING RATIO
PRESSURE (mb)
ALTITUDE (km)
PARTIAL PRESSURE OF OZONE (μmb)
10
100
1000
10
100
1000
45
40
35
30
25
20
15
10
5
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An airborne ozone measuring system was flown to 48km on a large light weight balloon. Excellent data was obtained throughout the flight and the results indicate that this may be an effective method of obtaining ozone profiles to high altitudes.

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